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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/783,124	02/19/2004	Bjarne Steensgaard	3382-66932	1217
26119 7590 01/24/2007 KLARQUIST SPARKMAN LLP 121 S.W. SALMON STREET SUITE 1600 PORTLAND, OR 97204			EXAMINER LU, KUEN S	
			ART UNIT 2167	PAPER NUMBER

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/24/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	Application No.	Applicant(s)	
	10/783,124	STEENSGAARD ET AL.	
	Examiner	Art Unit	
	Kuen S. Lu	2167	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 03 November 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

### DETAILED ACTION

1. The Action is responsive to Applicant's Amendment filed November 3, 2006.

Applicant's amendment made to claims 1, 10 and 16 and Page 6 of specification is acknowledged. Examiner's rejection of claims 1-20 under 35 U.S.C. § 101 in non-Final rejection of 8/29/2006 is hereby withdrawn.

2. As to Applicant's Arguments/Remarks filed November 3, 2006, please see Examiner's response in "**Response to Arguments**", following this Office Action for Final Rejection (hereafter "the Action"), shown next.

3. In the Arguments/Remarks, Applicant stated that amendment made to claims 1, 10 and 15 to overcome 35 U.S.C. § 101 does not constitute grounds for final rejection. Examiner respectfully agrees. However, Examiner also respectfully submits that, in the Action, the same grounds of rejection for claims 10-20 in the non-Final rejection of 8/29/2006 has been maintained while a new reference is introduced to reject claim 1 (and its dependents) to cover amendment where a data structure in memory representing memory region shape graph and a processing unit configured to identify memory region was newly introduced.

### ***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4.1. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites a processing unit is configured such that the

central processing unit can identify the partitioned region of memory. However, central processing is a basic component in a computing environment configuration and the unit is not further configured such that the central processing unit can identify the partitioned region of memory.

***Claim Rejections - 35 USC § 102***

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. §102 that form the basis for the rejections under this section made in this Office action:

5.1. A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5.2. Claims 10-11 and 16 are rejected under 35 U.S.C. 102(b) as anticipated by Mellender et al. (U.S. Patent 4,989,132, hereafter "Mellender").

As per claims 10 and 16, Mellender teaches "A method for compiling an object-oriented program, the program configured to be executed in a system employing region-based memory-management" and "A computer-readable medium containing instructions, which, when executed, cause a computer to compile an object-oriented program to be executed in a system employing region-based memory management" (See Abstract, Figs. 17-18, col. 2, lines 9-16 and col. 60, lines 19-47 where Alltalk tool compiles object oriented language source code and the tool, an object oriented

programming language system is integrated with memory management system wherein objects assigned to memory regions are associated by process) comprising:

"receiving source code for an object-oriented program" (See col. 2, lines 9-16 where Alltalk tool compiles object oriented language source code);

"performing a points-to analysis on the source code to develop at least one data structure containing region association metadata for the program" (See col. 2, lines 40-44, col. 6, line 29 - col. 7, line 14 where source code is parsed to generate a parse tree passed to routines for analysis and code generation, and database manager is utilized by compiler wherein database a prime file storing objects and a key file storing metadata of prime file);

"adding instrumentation to the program, the instrumentation configured: to cause objects to be created in regions based on information in the data structure" (See col. 54, lines 37-41, col. 57, lines 14-26 and col. 58, lines 15-40 where object manager and buffer manager are utilized by compiler for fetching objects, storing objects in memory regions, locking objects in memory and tracking objects in the memory buffers); and

"to cause deletion of all objects in a region when a determination is made that no objects in the region are referenced by any fields outside the region" (See col. 59, lines 55-68 and col. 62, lines 28-34 where unreachable objects are removed from database and garbage objects are collected based on context-region-process data); and

"compiling the program" (See col. 7, lines 34-45 where each method is compiled and symbol file is updated with class information).

As per claim 11, Mellender teaches "the data structure containing region association metadata comprises a shape graph" (See Figs. 20-21 where the graphs of in-use table and object tables, buffer, database and metadata show association of regions with processes and objects).

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6.1. Claims 1-9 are rejected under 35 U.S.C. 102(c) as anticipated by Mellender et al. (U.S. Patent 4,989,132, hereafter "Mellender") in view of Nilsen (U.S. Patent 5,687,368).

As per claim 1, Mellender teaches "A system for managing memory for an executing object-oriented program, the program comprising a plurality of objects" (See Abstract, Figs. 17-18 and col. 60, lines 19-47 where an object oriented programming language system is integrated with memory management system including memory regions, objects and database) and the system comprising:

"a computer-readable memory partitioned into a plurality of regions, each region

containing at least one object” (See col. 60, lines 25-35 where contexts are assigned to memory regions and new region is started when a current region is filled with a maximum number of objects and a new context is created); and  
“at least one data structure in the computer-readable memory representing at least one region shape graph” (See Figs. 17-18 and col. 60, lines 19-20 and 35-48 where objects are assigned to regions and regions are associated with processes such that objects associated with a process are assigned to some regions).

Mellender does not explicitly teach a data structure in the computer-readable memory representing region shape graph “describing relations between the regions, the relations based at least in part on references between objects contained in the regions”.

However, Nilsen teaches a data structure in the computer-readable memory representing region shape graph “describing relations between the regions, the relations based at least in part on references between objects contained in the regions” (See col. 33, line 40 – col. 34, line 2 where object occupies a region memory and object has a linked field pointing to next object for establishing relations between objects occupying regions of memory).

It would have been obvious to one having ordinary skill in the art at the time of the applicant’s invention was made to combine Nilsen’s teaching with Mellender reference because both references are directed to memory management where Mellender utilizes database storage and structure to integrate object-oriented and logic programming for improving programming language system performance while Nilsen utilizes dynamic memory management to achieve predictable performance, the combined teaching of

the references would have allowed Mellender's system further improves system performance because memory is dynamically managed to store more objects, instead of database, such that data access and allocation time is much deduced.

The combined teaching of Nilsen and Mellender references further teaches "wherein the processing unit is configured such that given a reference to a target object, the region containing the target object can be identified by using information from the at least one region shape graph" (See Mellender: Figs. 17-18 and col. 60, lines 19-20 and 35-48 where objects are assigned to regions and identified with region numbers, and Nilsen: col. 33, line 40 – col. 34, line 2 where object occupies a region memory and object has a linked field pointing to next object for establishing relations between objects occupying regions of memory).

As per claim 2, Mellender further teaches the following:

"the at least one region shape graph comprises a plurality of nodes connected by edges" (See Fig. 20 and col. 60, line 55 – col. 61, line 41 where a process ID is associated with region IDs in the in-use table and each region ID is associated with process IDs);

"each node represents a region in memory" (See Fig. 20 and col. 60, line 55 – col. 61, line 41 where each region in a process is a node to a process in the in-use table); and

"each edge represents one or more references between the objects of one region and the objects of another region" (See Fig. 20 and col. 60, line 55 – col. 61, line 41 where a



process ID links to a few region IDs wherein a region contains objects of different processes).

As per claim 3, Mellender further teaches the following:

"identifying a first region in memory which contains an object which has a reference to the target object" (See Fig. 20-21, col. 60, lines 50-54, col. 61, lines 28-41 and col. 62, lines 6-26 where in the object in-use table objects for a process are chained in order of regions from highest to lowest and the entries point to the target object, and further a parent object refers to a child object via instance variable);

"identifying a first node in the at least one shape graph which represents the identified first region" (See Fig. 20-21, col. 61, lines 28-41 and col. 62, lines 6-26 where in the object in-use table objects for a process are chained in order of regions from highest to lowest and the entries point to the target objects);

"identifying the edge leading from the identified first node which represents the reference to the target object" (See Fig. 20-21, col. 61, lines 28-41 and col. 62, lines 6-26 where the chain connecting objects for a process is identified from one object to next in order of regions from highest to lowest and the entries point to the target objects);

"identifying a second node which the identified edge leads to" (See Fig. 20-21, col. 61, lines 28-41 and col. 62, lines 6-26 where the chain connecting objects for a process is identified from one object to next in order of regions from highest to lowest and the entries point to the target objects, for example, objects B-D are sequentially chained via entries 106-110 and object C is the second target); and

"identifying the region which is represented by the second node as the region containing the target object" (See Fig. 20-21, col. 61, lines 28-41 and col. 62, lines 6-26 where the objects in-use table having regions identified by the object entries, for example, target object B is in region 1, the second node).

As per claim 4, Mellender further teaches "each region has a shape-graph associated with it and each shape-graph is stored along with the regions it is associated with" (See Fig. 20-21, col. 61, lines 28-41 and col. 62, lines 6-26 where each region is chained differently in according the residing objects and their association with process).

As per claim 5, Mellender further teaches the following:

"a memory-management software module configured to determine, for a region, when no objects contained in the region are referenced by any fields outside of the region" (See col. 63, lines 23-45 where a region cleaning module to determine a region be cleaned based on the tracked number of objects accumulated in the region since last cleaning); and

"delete the region upon making such a determination" (See col. 63, lines 23-45 where a region cleaning module determines a region be cleaned based on a tracked number of objects accumulated in the region since last cleaning).

As per claim 6, Mellender further teaches the following:

configured to determine when no objects are referenced comprises configured to keep a count for each region of the number of references made to objects contained in the region" (See col. 63, lines 23-45 where a region cleaning module determines a region be cleaned based on a tracked number of objects accumulated in the region since last cleaning); and

"upon determining that the count for a region is zero, determine that no objects contained in the region are referenced by any other fields" (See col. 63, lines 47-60 where region cleaner looks up region to be cleaned).

As per claim 7, Mellender further teaches "comprising a garbage collector" (See Fig. 19 and col. 59, lines 40-68 where a garbage collector is included in the memory management system).

As per claim 8, Mellender further teaches "at least one shape graph represents fewer than the total number of regions" (See Fig. 18 and 20 where the in-use table diagram shows less number of regions than a total number of regions).

As per claim 9, Mellender further teaches "where no more than one region parameter is passed to a method for every object passed to a method" (See Figs. 17-18 and col. 60, lines 1948 where a set of objects are assigned to a region and an object is assigned to only one region).

***Allowable Subject Matter***

7. Claims 12-15 and 17-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten to overcome the rejections(s) under 35 U.S.C. § 101, and in independent form including all of the limitations of the base claim and any intervening claims.

***Reason for Allowance***

7.1. In Examiner's current action of 35 U.S.C. §102(b) non-Final Rejection for the instant application as described above is based on reference Mellender et al.:

"OBJECT-ORIENTED, LOGIC, AND DATABASE PROGRAMMING TOOL WITH GARBAGE COLLECTION", U.S. Patent No. 4,989,132, issued January 29, 1991.

The Mellender reference provides an object oriented programming tool that integrates object-oriented and logic programming, database facilities and an improved garbage collector which employs a concept of regions garbage collection.

The Mellender reference teaches partitioning memory in regions and providing shape-graph describing relations between regions, objects in regions and identifying target object by using shape graph information.

However, Mellender reference does not teach the combined subject matter of "creating shape graph defined by parameter alias sets which are created and unified based on object-oriented program statements; and associating shape graph with memory regions" or "creating region, given a shape-graph; allocating object within region, given an object and a region; and identifying region reference, given region and identifier", as described in each claim in groups (12, 17) and (13,18), respectively.

After a thorough search for the prior art conducted on EAST database and domains

(NPL-ACM, Google, NPL-IEEE), and a detailed examination of the search results, Examiner is convinced that the prior art searched and made of record does not teach the combined subject matter of further combining partitioning memory in regions and providing shape-graph describing relations between regions, objects in regions and identifying target object by using shape graph information with the subject matter of "creating shape graph defined by parameter alias sets which are created and unified based on object-oriented program statements; and associating shape graph with memory regions" or "creating region, given a shape-graph; allocating object within region, given an object and a region; and identifying region reference, given region and identifier".

***Response to Arguments***

8. As to Applicant's Arguments, filed on November 3, 2006, has been fully considered, please see discussion below:

At Pages 11-12, concerning claim 1, Applicant argued that Mellender reference does not teach or suggest memory "shape graph describing relations between ...". In responding to amendment made to the claim, Examiner respectfully submits that the new Nilsen reference was introduced and combined with Mellender reference for proving specific teaching. Please refer to the Action.

At Page 13, concerning claim 10, Applicant argued that Mellender reference does not teach or suggest "performing a point-to analysis ...". As cited in the Action, Examiner

respectfully submits that a parse tree generated and anchored in a method structure and, in turn, linked to a single class structure where the class structure is analyzed for code generation and respectfully believes the cited sections does interpret the element.

At Page 14, concerning claim 16, Applicant made a similar argument as of claim 10, Examiner respectfully submits the same response as above.

At Page 14, concerning grounds of finality and interview arrangement, Examiner respectfully agrees Applicant's position. However, grounds for finality made in the Action did not take advantage of claim amendment made for overcoming 35 U.S.C. § 101 rejection. Furthermore, Examiner thanks to Applicant for responding to Examiner's communications during a long period of extremely severe weather condition.

**9. The prior art made of record**

A. U.S. Patent 4,989,132

G. U.S. Patent 5,687,368

**9.1** The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

B. U.S. Patent 6,964,037

C. U.S. Patent Application 2005/0234985

D. U.S. Patent 6,839,895

E. U.S. Patent 6,865,657

F. U.S. Patent 6,249,793

***Conclusion***

10. Applicant's amendment necessitated the new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

***Contact Information***

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kuen S. Lu whose telephone number is (571) 272-4114. The examiner can normally be reached on Monday-Friday (8:00 am-5:00 pm). If attempts to reach the examiner by telephone are unsuccessful, the examiner's Supervisor, John Cottingham can be reached on (571) 272-7079. The fax phone number for the organization where this application or proceeding is assigned is 703-305-39000.

Art Unit: 2167

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for Page 13 published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 703-305-3900 (toll-free).

Kuen S. Lu

  
Patent Examiner, Art Unit 2167

January 22, 2007



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